Tunable piezoresistivity of nanographene films for strain sensing

With the support by the National Natural Science Foundation of China and the National Basic Research Program of China, and Strategic Priority Research Program (B) of the Chinese Academy of Sciences, Prof. Zhang Guangyu's laboratory at Beijing National Laboratory for Condensed Matter Physics and Institute of Physics, Chinese Academy of Sciences, reported the tunable piezoresistivity of nanographene films for strain sensing, which was published in *ACS Nano* (2015, 9(2): 1622—1629).

The graphene-based strain sensors have attracted much attention recently. Usually, there is a trade off between the sensitivity and resistance of such devices, while larger resistance devices have higher energy consumption. In this paper, we report a tuning of both sensitivity and resistance of graphene strain sensing devices by tailoring graphene nanostructures. For a typical piezoresistive nanographene film with sheet resistance~100 kΩ/□, a gauge factor over 600 can be achieved, which is 50× larger than those in previous studies. These films with high sensitivity and low resistivity were also transferred on flexible substrates for devices integration for force mapping. Each device shows high gauge factor over 500, long life time over 10^4 cycles, and fast response time less than 4 ms, suggesting a great potential in electronic skin applications.

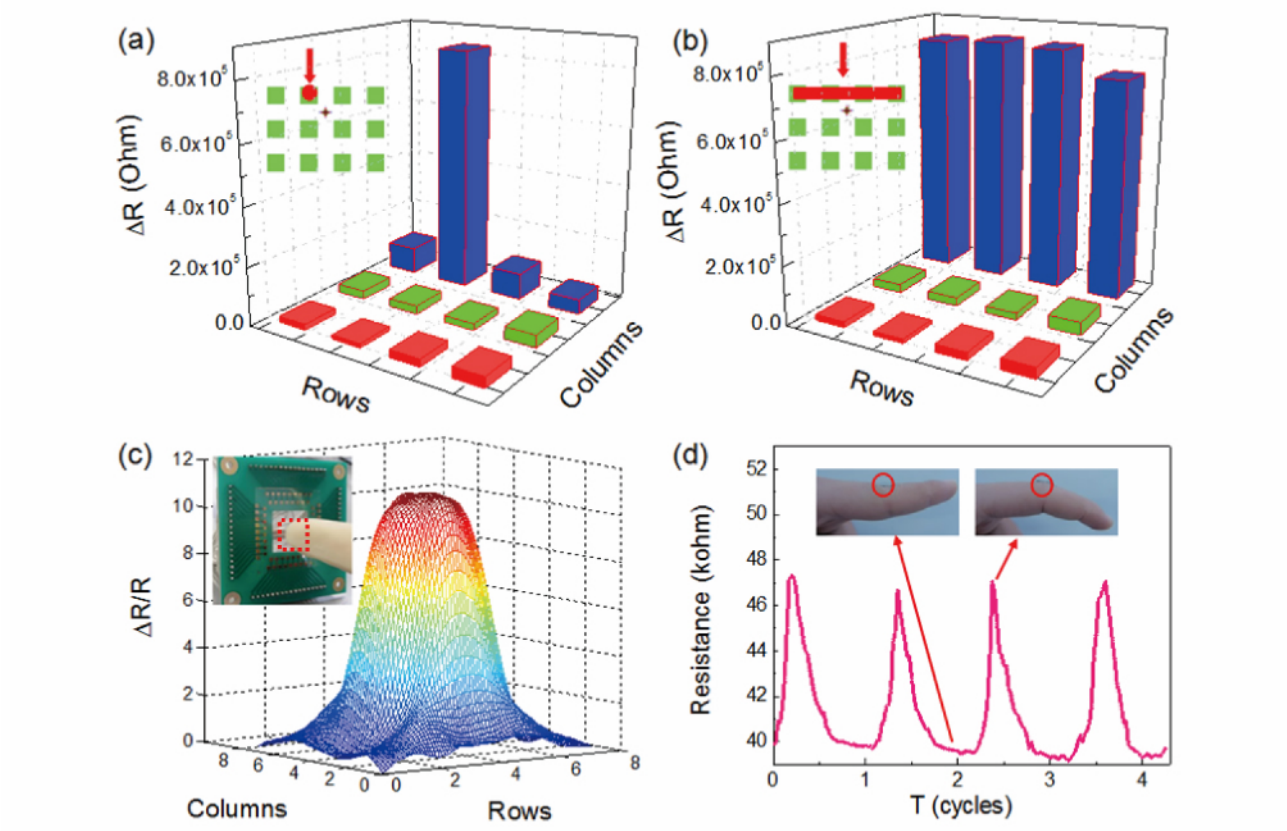

Figure Multi-dimensional tactile sensing image of e-skin. (a) and (b) demonstrate the "point"-and "line"-stress tests on a 3×4 devices array. (c) Measurement of the electric response with applying finger touching (inset). The resistance change rate reflects the strain distribution. (d) Artificial electronic skin on PDMS substrate attached on a finger to detect the movement of knuckles.